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Science and Mathematics in the Catholic Schools: A Pilot Survey

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Does Formal Science Teaching Belong in the Elementary School Curriculum: A Debate

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SCIENCE AND MATHEMATICS IN THE CATHOLIC SCHOOL: A PILOT SURVEY

REV. JOHN J. GREEN, O.S.F.S.[1]
AND
REV. O'NEIL C. D'AMOUR[2]

While it is sometimes disturbing to the educators, it is a fortunate fact that the crises which occur and reoccur in the course of the growth of civilizations have severe impacts upon the schools of such civilizations. It is fortunate because through such impacts the schools are forced constantly to re-evaluate their programs and are impelled to make the adjustments and changes demanded by the developing needs of the age. At the present time, the crisis of the world in the nuclear age, a crisis brought into focus by the spectacular advances made by the Soviet Union in scientific fields, is making its impact on the schools of America. Since the first announcement of the successful orbiting of Sputnik and the publication by the U. S. Department of Health, Education and Welfare of EDUCATION U. S. S. R., Americans on all levels have been seeking to ascertain whether their schools are meeting the needs of the students and the nation. While this attention has been centered upon the public schools, Catholic educators are aware of the grave implications of the crisis for Catholic education. They are aware that it is most probable that modifications and changes will be needed in the Catholic schools as the demands of this new age reveal themselves. Recognizing that science and mathematics would be the first areas of concern and that it would be necessary to know the present status

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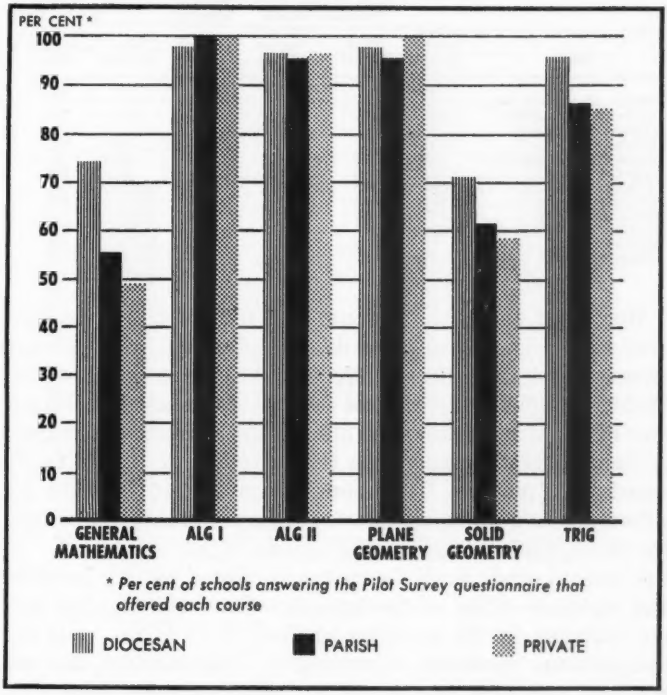
of these courses in the schools, the Secondary School Department and the Department of School Superintendents of the National Catholic Educational Association decided to survey the Catholic schools. It was decided first to conduct a pilot study and then to follow the pilot study with a complete survey. This present article is a report on the results of the pilot study.

For the purposes of the pilot study, four hundred and thirty-four (434) schools were selected to be surveyed. This group was composed of one hundred and forty-five (145) diocesan schools, one hundred and fifteen (115) parish schools, and one hundred and seventy-four (174) private schools. Questionnaires were sent out to all of these schools. The questionnaires were concerned with the fields of mathematics, science, guidance, and with science laboratories and their equipment. There was no attempt made to evaluate the quality of the courses, the qualifications of teachers, or the proportion of students enrolled in such courses. These matters were left to the complete survey which is to follow. Of the four hundred and thirty-four (434) questionnaires sent, three hundred and twenty-five (325) were completed and returned. The group returned represents one hundred and nine (109) diocesan schools, one hundred and thirty-five (135) private schools, and eighty-one (81) parish schools. This represents a 74 per cent return. This percentage is, we believe, such as to indicate an adequate sampling. In the present report we feel that there should be some norm of comparison in respect to progress. Therefore, we are using the figures compiled by Sister Mary Janet Miller in her study, *Catholic Secondary Education . . . A National Survey,* and by Father Edward F. Spiers in his study, *The Catholic Central High School.* Sister Mary Janet made her study in 1949 and Father Spiers made his study in 1951. Sister Mary Janet surveyed three hundred (300) high schools in all categories; Father Spiers surveyed ninety-one (91) diocesan high schools.

Turning first to the field of mathematics, Figure A presents in graphic form the picture as revealed through the survey.

FIGURE A

Comparison of Mathematics Courses Offered in Diocesan, Parish and Private High Schools



It can be seen that almost 100 per cent of the schools surveyed are offering Algebra I, Algebra II and Plane Geometry. It is interesting to note that in the advanced fields of Solid Geometry and Trigonometry the diocesan schools are considerably in advance of the private and parish schools. As would be expected because of their more comprehensive nature, more diocesan schools also are offering General Mathematics. Referring now to Table 1, it is evident that the present study shows a considerable improvement over the situation as reported by Sister Mary Janet.

TABLE 1

Comparison of Number of Mathematics Courses Offered as Shown by Three Studies (Pilot, Spiers's and Sister Mary Janet's)

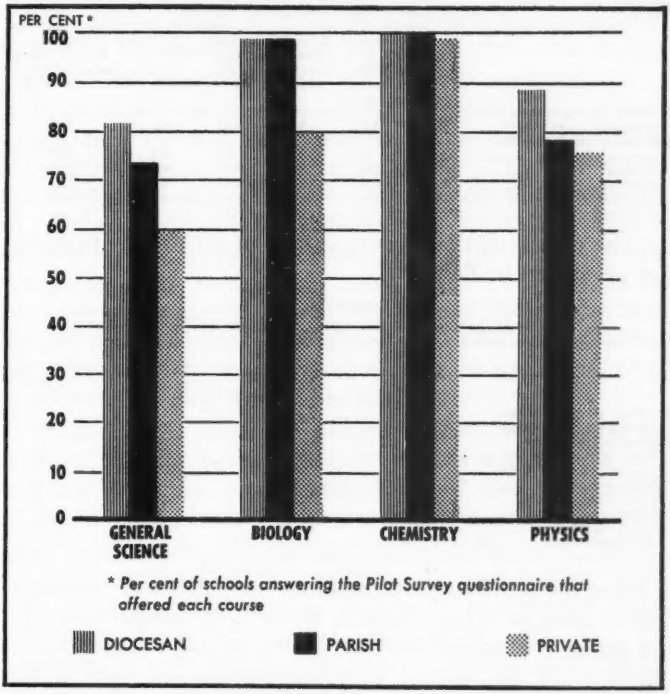
Item	Pilot Survey Totals	Diocesan Schools		Private Schools	Parish Schools	
		Pilot Survey	Spiers's Survey (1951)	Pilot Survey	Pilot Survey	Sister Mary Janet's Survey (1949)
Number of schools included in each study ..	325	109	90	135	81	300
Mathematic courses offered:						
General Mathematics ..	192	81	44	65	46	84
Algebra I	325	109	90	135	81	278
Algebra II	320	108		134	78	
Plane Geometry	321	108	90	133	80	272
Solid Geometry	219	90		82	47	
Trigonometry	279	104	73	115	60	178
Calculus	20	6		13	1	
Other	62	17	38	39	6	15

Her study shows that twenty-two (22) of the three hundred (300) schools surveyed did not offer Algebra at all and twenty-eight (28) did not offer Plane Geometry. However, Father Spiers's study in these same fields shows that 100 per cent of the schools surveyed offered the courses. In respect to General Mathematics, the three studies present a fairly consistent picture. This consistency might indicate an adherence to a policy of offering General Mathematics only for those students not preparing for higher education. In the present study Solid Geometry is offered by two hundred and eighteen (218) of the schools. Since this subject was not included in the previous studies, there is no basis for comparison. However, in regard to Trigonometry, the two hundred and seventy-nine (279) schools of the three hundred and twenty-two (322) indicating that they offer this subject represent a notable improvement over the situation as reported by Sister Mary Janet. As compared with the study by Father Spiers, the present survey marks an advance but not one that is of great significance.

The trends in the courses offered in science are shown graphically in Figure B. It can be seen that, although the over-all situation is good, the central and private schools present a much better picture than do the parish schools. Table 2 reveals that there has been an increased emphasis on science over the years.

FIGURE B

Comparison of Science Courses offered in Diocesan, Parish and Private High



Using Sister Mary Janet's study for comparison, the increase in General Science will be seen as not particularly large. However, in the three major scientific fields, Biology, Physics, and Chemistry, the increase is significant. With two hundred and ninety-five (295) of the three hundred and twenty-five (325) schools offering Biology, two hundred and sixty-four (264) Physics, and three hundred and twenty-four (324) Chemistry, it would seem that the schools have attempted to keep pace with the increasing importance of science in life. Once again, when we turn to Father Spiers's study, we find that there is no significant

statistical difference between the present study and that of diocesan high schools in science offerings.

TABLE 2

Comparison of Number of Science Courses Offered as Shown by Three Studies (Pilot, Spiers's and Sister Mary Janet's)

Item	Pilot Survey Totals	Diocesan Schools Pilot Survey	Diocesan Schools Spiers's Survey (1951)	Private Schools Pilot Survey	Parish Schools Pilot Survey	Parish Schools Sister Mary Janet's Survey (1949)
Number of schools included in each study ..	325	109	90	135	81	300
Science courses offered:						
General Science	231	89	54	82	60	180
Biology	295	106	77	109	80	202
Physics	264	98	69	102	64	192
Chemistry	324	109	88	134	81	236

The results of the present survey of laboratory facilities are presented in Table 3.

TABLE 3

Number of Laboratories by Category as Shown by Pilot Survey

Item	Pilot Survey Totals	Diocesan Schools	Private Schools	Parish Schools
Number of schools included in each study ..	325	109	135	81
Laboratories:				
Each Science	109	44	49	16
General Scence Only .	49	22	23	4
Biology	142	54	68	20
Chemistry	182	56	98	28
Physics	157	53	81	23
Combination	103	49	29	25
No Laboratory	6	1	2	3

Since the previous studies did not give detailed consideration to such facilities, there is no basis of comparison with the past. The present survey indicates that approximately one-third of the schools have laboratories for each of the sciences, with the exception of General Science. Only forty-nine (49) of the three hundred and twenty-five (325) indicate that they have a laboratory specifically for General Science. However, one hundred and forty-one (141) have a specific laboratory for Biology, one hundred and eighty-two (182) for Chemistry, one hundred and fifty-seven (157) for Physics. In addition, one hundred and thirty-four (134) have combination laboratories of various kinds. The study also questioned concerning the equipment available for the teaching of the various scientific disciplines. The questionnaire contained a list of the basic items of equipment needed for adequate instruction. The schools

were asked to indicate as to whether they possessed the various items and also to indicate whether the item was modern or obsolete. While it would be impractical in this report to give a breakdown of the answers, it can be said that the survey shows that the basic equipment is possessed by almost all schools. It further shows that this equipment is fairly modern.

A study of the answers to the questions on guidance reveals that there is an almost complete lack of trained personnel in the field of formal guidance. The answers to the questions would show that the schools are aware of the importance of guidance but that the personnel problem forces them to place the responsibility in the hands of the regular teaching staff. This policy finds its reflection in the testing programs. While every school shows adequate testing in the fields of intelligence and achievement, there are relatively few programs of testing in aptitudes, personality ratings, and vocational guidance.

These are the facts and figures of the study insofar as they are able to be reported on in this article. Before essaying to consider the implications of these facts and figures, it should be emphasized once again that the survey did not attempt to seek information concerning the quality of the teaching in the fields involved. We have no knowledge from this survey of the qualifications of the teachers, their degrees, or their experiential background. We have no knowledge concerning the number of students enrolled in the courses or the percentage they might represent of the whole. However, although these matters represent a knowledge lack, they are matters which did not fall within the scope of the present study. We wish to point out that this study is simply a pilot study and that it is to be followed by a more complete and detailed survey of the entire scene.

The results of this study give ample evidence that the assertions of the critics that schools are neglecting the "hard" subjects do not apply to Catholic schools. Not only have they continued to offer the basic courses in mathematics and science but they have increased their offerings in these fields. This is, of course, in keeping with the

traditional curriculum concepts which are part of the philosophy of education of Catholic schools. However, it also might be attributed to the improvement in the preparation of teaching personnel and to the enlargement of the schools during the postwar years of national prosperity. This conclusion is supported by the fact that the present survey shows little improvement over the survey conducted by Father Spiers. Father Spiers's study was concerned only with the central schools. These schools are usually quite large and well-staffed. It would seem, then, that the statistical differences between Sister Mary Janet's study, the Spiers's study and the present study might be attributed to weakness in the smaller parish schools. The present study would indicate the continuing trend toward the elimination of the smaller schools in favor of the larger central schools. The parish schools remaining under this trend would be large enough to be sound educationally. The writers of this article believe that it is safe to conclude from the study that there is ample evidence that the Catholic schools are meeting the needs of the students in the fields of mathematics and science. They believe that, recognizing the reluctance of Catholic schools to grant electives, a large proportion of the students are enrolled in these courses.

The picture in guidance is not so optimistic. There is definite evidence of a lack of trained personnel. With the need for teachers in the subject matter fields, it is doubtful if any large percentage of Catholic schools will find it possible to prepare people for special guidance work. We believe that this study underlines the necessity of careful thinking by Catholic educators on this matter. A way must be found of meeting this problem. Perhaps through such thinking, some compromise solution might be found until the day arrives when the schools can reach the ideal. It is perhaps not too much to hope that the proposed government program might offer help in this regard. It would certainly be harmful to the national welfare if efforts to improve American education in the fields of guidance and counseling did not extend to the five million children in the Catholic schools.

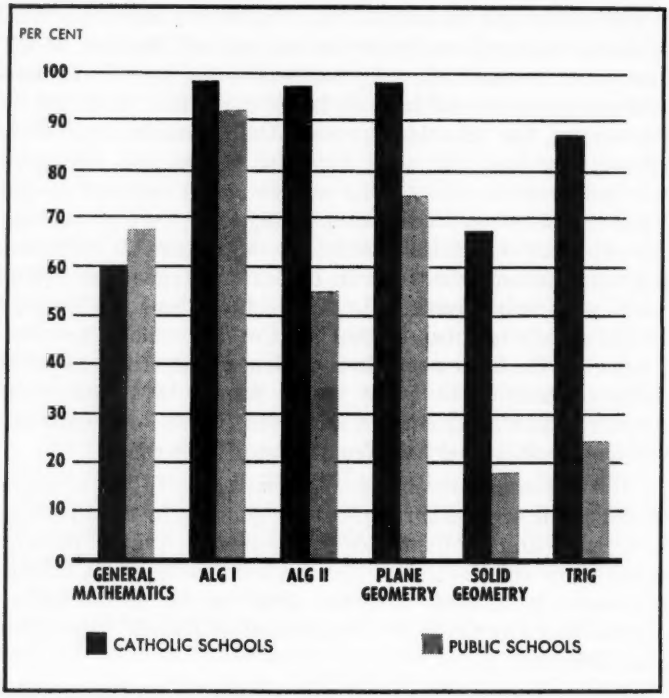
As was mentioned above in the treatment of laboratory equipment, it seems that most of the schools have the basic equipment needed. However, this equipment is that which is needed for the traditional teaching of the sciences. The dramatic changes, especially in the field of Physics, which have been brought about by nuclear research will demand new and expensive equipment. In the opinionnaire section of the survey, the schools expressed their concern over this. They recognized the need for such equipment but were worried over the cost. This was in sharp contrast to the hopeful attitude expressed concerning the future as regards the improvement of basic facilities. Many schools indicated that the inadequacies both in laboratory space and equipment were being remedied. These facts lead the writers of this article to conclude that the Catholic schools are able to care for the basic needs in the sciences but, if the national welfare demands that the young people be prepared in nuclear physics and certain advanced phases of chemistry, the schools will need help from outside sources.

How do the Catholic schools compare with the average of the public schools throughout the country in the offerings in science and mathematics? Figures C and D present graphically the results of the present survey of Catholic schools as contrasted with the 1956 survey of the public schools made by the U. S. Department of Health, Education and Welfare.

For purposes of comparison it should be noted that the present survey encompassed 13 per cent of the Catholic schools of the nation while the HEW survey encompassed 10 per cent of the public schools of the nation. It should also be noted that the comparison here made is between the present survey and the four-year high schools in the HEW survey. Referring to Figure C, it can be seen that more public schools are offering General Mathematics than Catholic schools. However, in all other fields of mathematics, the Catholic situation is considerably better. This is particularly true in the higher fields. Turning to Figure D, the differences between the two systems are not as great in the sciences as they are in mathematics. Once again, more

FIGURE C

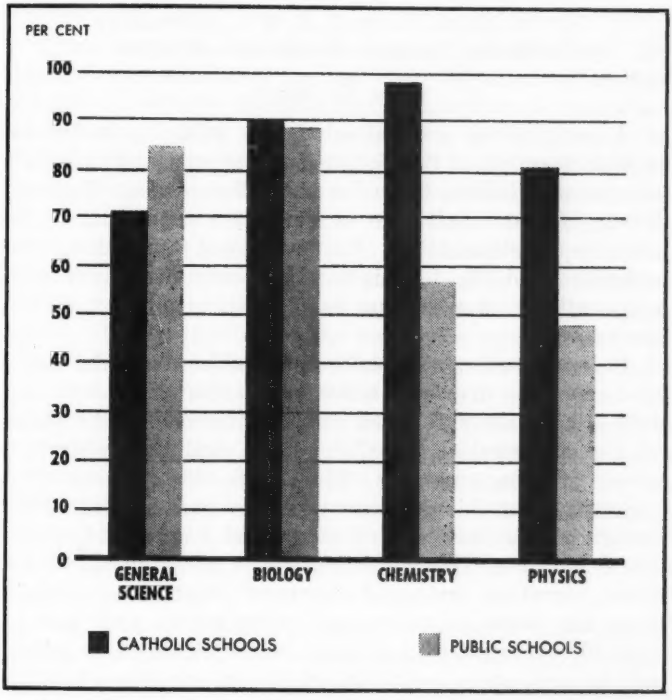
Comparison of Mathematics Courses Offered in the Catholic and Public Schools as Shown by Pilot Survey and the HEW Survey



public schools are offering General Science than are the Catholic schools. The situation in Biology is almost identical in the two systems. However, where practically 100 per cent of the Catholic schools are offering Chemistry, less than 60 per cent of the public schools are offering this subject. In regard to Physics, over 80 per cent of the Catholic schools provide the course while less than 50 per cent of the public schools include it in their curriculum. We would urge that no drastic application be made of these figures. The problems of the two school systems differ radically, and we feel that a comparison in this case would not be entirely valid. Its use in the present article is merely to emphasize that the Catholic schools have retained their insistence upon higher

FIGURE D

Comparison of Science Courses Offered in the Catholic and Public Schools as Shown by Pilot Survey and the HEW Survey



mathematics and science. We feel that the present study shows that the Catholic schools are making great efforts to keep pace with the scientific age. They are offering very adequate programs in mathematics and science. They have or will have in the near future the basic equipment necessary for teaching. They, however, will need help in the securing of the expensive equipment demanded by recent advances. There is a decided weakness in the field of guidance. The schools recognize this weakness but are helpless at this time to overcome it. We believe that the picture presented through the survey is a bright one and that the Catholic schools are making today, as they have in the past, a great contribution to the strength and well-being of our country.

DOES FORMAL SCIENCE TEACHING BELONG IN THE ELEMENTARY SCHOOL CURRICULUM: A DEBATE

SISTER MARIA CLARE, R. S. M.[1]—*Affirmative*
REVEREND RICHARD STANTON[2]—*Negative*

Yes, It Does!

A satisfactory general education today must include an understanding of the discoveries of science and an insight into the possibilities for using these discoveries. The conditions of man's existence on earth are dependent on his using his scientific ability. Without a good foundation in the principles and the techniques of science the children of today will be at a serious disadvantage in the world of tomorrow.

It is, however, a mistake to consider the need for a good education in science a matter of expedience only. The child is naturally interested in his environment: the physical forces, chemical transformations, and the fascinating variety of living creatures. The satisfaction of this natural curiosity about his Father's work is part of the child's birthright and will contribute to the enrichment of his life as surely as the contemplation of great works of art, music, literature, and social structure. Furthermore, Christians can hope to counteract materialistic and pseudo-scientific propaganda, and unethical applications of science only by adequate scientific knowledge informed by Christian philosophical principles. Science, therefore, has this special twofold value in Catholic education.

The newly awakened public cognizance of the need for more science education has created general interest in the acceleration of high school and college programs. Trends seem to favor the gradual elimination of general science in the high school and to rely on completion of the equivalent of general science by the end of the eighth grade. It is, there-

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fore, worth considering in some detail the factors that constitute a desirable science background for the high school freshman before he embarks on the study of a specialized science.

Great concepts in science include the following: the physical organziation of the universe, the nature of matter and radiant energy, the relation of structure to properties in non-living things, and to functions in living things; the laws governing the transformations of matter and energy; the similarities and differences of living things, their great variety, their interdependence and their adaptations to environment; the organization of the human body, particularly the community of cells, tissues, organs and systems, and the function of the body as an instrument of the human person. Understanding of the principles involved in these relationships, necessary familiarity with the instruments and methods of science, and the stimulation of ideas for further investigation are long-range objectives of science teaching. Without an insight into the problems of science in general, particular experiments and organized data of chemistry, physics, botany, and zoology seem isolated and tedious. How does one acquire an appreciation of the interrelationships of phenomena that have never been the object of one's consideration?

If a general science program in seventh and eighth grades is to achieve its purpose as an introduction to scientific analysis and as a survey of the scope and limitations of science, this program must rest on a broad foundation of observation and experience. There is not enough time available in these two years for the teacher to help children to observe all the things they should, to analyze their experiences, to derive and use simple quantitative relationships and to provide for individual planning of controlled experimentation and evaluation of results.

The great need is for time: time to observe, to think, to compare, to wonder, to try out new ideas, to arrive at meaningful generalizations. This is the kind of time that will never be available in the classroom. It is, however, the kind of time children have; they need only direction and

encouragement to put the time to good use in their exploratory years. Work with five-year-olds, conducted by Sisters Mary de Lourdes and Mary Felita in the Saint Joseph College School for Young Children, shows that educators have not even begun to tap the possibilities for scientific observation in young children. "Science" in the lower grades of the elementary school is really "preparation for science," the opening of new interests through systematic provision for a wide variety of observations and experiences with the things in the environment.

This "preparation for science" the elementary school teacher must direct with the help of a well-planned curriculum. She need not worry about knowing how to construct a radio or a gasoline engine. The children can and will do these things by themselves with the help of kits and manuals of directions. What the teacher should aim to do is to help the children make a part of their own experience some timeless concepts and phenomena; for example, there is electricity in everything; the ray of sunlight coming into the classroom tells many things about the universe; shadows help man to find out how the earth and the sun are moving relative to each other; uneven heating of the earth, the air, and the water make the weather.

A series of planned observations is needed also to lay the foundation for real understanding of "balance in nature." Knowledge of animals and plants should include members of many groups other than mammals and seed-bearing plants. Observation of as many as possible in their own habitat is desirable: algae, mosses, lichens, fungi, sponges, and jellyfish. The curiosity and exploratory nature of children will profit by good direction to provide a rich first-hand knowledge of the characteristics and adaptations of a great variety of living things.

Can these objectives be realized without the help of an organized (but not rigid) science curriculum of this kind? Those who oppose the inclusion of science as a definite subject on the elementary level usually do so on the grounds that the time is urgently needed for more thorough training in the basic skills. It is ridiculous, they say, to try to

teach science in high school to students who cannot read, write, spell, or do arithmetic. Years of teaching science in high school and in college enable the author to understand this viewpoint. However, the opponents of science in the elementary school are assuming that the basic skills are directed mainly toward *reading about things.* Is not the learning of observation as important a skill-objective as learning how to read, write, and spell? Furthermore, one cannot drill on basic skills five hours a day, five days a week, without providing occasional periods of relief and inspiration.

Actually the allotted "science-time" need not be more than one period a week in the lower grades if it is used effectively to awaken interests and train powers of observation and to provide co-ordination with the whole curriculum. If educators consider it worthwhile to include art, music, history and geography, they cannot exclude science. Teachers who have worked with children and learned how to capitalize on their interest in science, know that it has tremendous possibilities for integration in the curriculum. There is a great need for the strengthening of arithmetic concepts through using them in science. Familiarity with the meaning and magnitude of measurements of length, volume and weight would remove many barriers in arithmetic problems. Health, safety and conservation-education form an integral part of the science program in the upper grades. In the lower grades certain ideas come up repeatedly and lay a sound foundation for these learnings; children are constantly discovering that all living things have certain conditions under which they grow and function best.

A scientific interest is a powerful stimulus to reading for many children who would not read otherwise. The interesting science readers available ensure that the poor reader need never be discouraged. The teacher can always direct his attention to books of interest in his own reading level. Science interests often provide stimulating subjects for written and oral composition to children not especially excited about describing the view from their front porch or the trip they took last summer.

If a teacher is expected to teach science only "incidentally," she will either omit it all together, or find herself in difficulties because she will be uncertain as to the best answers to children's random questions and will not be sure enough of their background to know how to help them to answer their own questions. It is much better to guide the interests of the children by a well-planned curriculum and ensure a good background of science experience so that questions arise in favorable educational situations. The program can remain flexible within each grade if the curriculum indicates the number of lessons to be spent in different areas, and insists on rigid sequence only where such sequence is essential to logical development of important concepts. The teacher can then take maximum advantage of possibilities of integration with other subjects—arithmetic, geography, social studies, health and safety, or with seasonal opportunities.

A planned curriculum will also accomplish a satisfying, naturally developed integration of science, religion and philosophy. In the lower grades the children have a chance to see through science that all the things God made work together, that they are full of surprises, and that God made man intelligent so he could discover these surprises and learn how to use them for his own interests and in the service of his neighbor. In the upper grades the children are ready to bring the findings and applications of science to bear on Christian philosophical questions: what is the universe? what is man? what is an equitable distribution of material goods and the contribution of science to justice and charity?

Only if science in the elementary school is organized as a definite subject, with a plan and a purpose, with due consideration for all the important factors in the education of young children, will science teaching in the high school and college be likely to improve; and then science will be seen not as a meaningless burden of facts to be memorized, nor as a panacea for all the ills of a materialistic society, but rather as an integral part of the adventure of Christian living.

No, It Doesn't!

Should science be taught in a formal manner in the elementary school with a definite time allotted to it in the schedule? This is not only an interesting subject for discussion, but it is also one which is heavily laden with emotional overtones. The satellites whirling overhead have focused popular attention upon science. When people today ask questions concerning the schools, they are seeking information, in almost every instance, about the courses in science. Educators have not been immune to the science "virus"; the professional journals have been filled with articles on the subject. In such an atmosphere, it is with some misgivings that I seek to express publicly my own deep conviction against the formal teaching of science in the elementary school.

My aversion to the teaching of science in the elementary school has almost nothing to do with science as such. As I see it, science as such has very little to do with the question involved. The basic question is concerned with the function of the elementary school. The reason for asserting this should be obvious. Should not the question as to whether any particular subject belongs in the curriculum be determined by the purpose of the level of education involved? Any other policy could only result in a haphazard educational program, lacking direction or reason.

Perhaps this is part of the explanation for the troubles of American education. We seem to have taken Dr. Dewey's philosophy of "becoming" a little too seriously. To become is a very wonderful thing as long as you are becoming something and that something is good. In other words, there must be a purpose. So with the elementary school, it must have a purpose, a function to fulfill. What is this function? I would say that it is threefold and that the threefold division must be considered in the order of importance. In my opinion, the primary purpose of the elementary school is to inculcate the basic skills and in this way to prepare the child for higher education. The secondary purpose would be the development of the sound traits of character essential for success in further education and for

life in American society. The third purpose would be the imparting of a knowledge of content material in various areas. I believe this order to be an order of primacy. No consideration of the secondary or tertiary levels of function must be allowed to interfere with the attainment of the primary function. Thus, the elementary school exists primarily to inculcate the skills; it does not exist primarily to develop character or to impart knowledge in content fields.

This is the frame of reference that I feel should be used when considering the addition of a subject to the elementary school curriculum. Let us then consider the addition of science as is suggested. First of all, we must ask: "Is science a basic skill?" It evidently is not, since all authorities would identify the basic skills as the traditional reading, writing, and arithmetic. Is it then necessary to the child's preparation for high school? This argument is frequently advanced but is one that is quite specious. High school science teachers do not complain because the incoming students do not know science. They do complain because they cannot read or cannot comprehend mathematics. Science, then, does not contribute to the fulfillment of the primary function of the elementary school. Does it contribute to the secondary and tertiary functions? It must be admitted that it does. As it helps the child to understand nature and natural processes, it should help him to make his adjustment to the world in which he lives. Also, it is certainly a content field.

However, in regard to the secondary and tertiary functions, there is a question of priority. There are so many subjects and activities clamoring for the attention of the elementary school that some norm must be established for selection. The only alternative to selection would be to allow the already overcrowded elementary school curriculum to be further burdened by the addition of another subject. This would interfere with the attainment of the primary purpose of the school. It would seem then that if science is to find its way into the classroom, it must displace a subject already being taught. Since the skills must remain, would the proponents of science eliminate history,

geography, civics, or music? I believe that most teachers would agree that these subjects are more important in the fulfilling of the secondary and tertiary functions of the school than would be science.

Is the elementary curriculum overcrowded? Examine the daily schedule of the average elementary school. One would think that the child's total education had to be cared for in the elementary school. No aspect of life is omitted. Is the curriculum overcrowded? Ask the elementary school teacher as she struggles to do her preparation in a galaxy of subjects. This is the reason I object to the introduction of science into the elementary school. It does not contribute to the primary function of the school; it is lower in the hierarchy of subjects than the already included fields; it would be harmful to the school should it be super-added.

Is this view of the elementary school too narrow? In such a view what happens to the myriad wonderful concepts which have enriched educational thought? What happens to the education of the "whole child"? What happens to "life adjustment"? I would answer that nothing happens to them except that it is realized that the education of the "whole child" and his "adjustment to life" does not need to be accomplished in the first six years. Elementary education is not terminal; it is merely the fundamental preparation for further education. Any broadening of educational perspectives must be cared for within the framework provided by the functions of the elementary school.

Various arguments are offered by the proponents of elementary school science. We are told that the child needs to know about science because it is all about him; he hears about it on the radio and sees it on television and reads about it in his comic books. I have an idea that the child hears many other things on the radio; he sees many other things on television; he reads many other things in comic books. Is the school to teach all of these things, too? We are told that the child wants science. There are many things the child wants. Are we to give him what he wants or what he needs? Someone must select and choose and

this means not only not giving the child everything he wants but it means giving him many things that are unwanted. We are told that the child needs science to prepare him for high school courses. The best possible preparation for any advanced course in science is the ability to read well and to understand mathematics. We are told that the child must be introduced to science in the elementary school so that more of our youth might be enticed to choose science as a career. Would it not be wise to leave the choice of a career to a little later in the educational process? Moreover, a major reason for the failure of many of our young people to choose a career in science is not lack of contact with science but rather a lack of preparation in the basic skills needed in the difficult and disciplined realm of science. I wonder, too, if the advocates of some of these arguments realize the harm that might be done by elementary school teachers inadequately prepared in science. This is no criticism of the elementary school teachers. They must already be experts in the teaching of reading, writing, and arithmetic. They must be well acquainted with world geography and all the fields of history. They must be experts in child psychology. Should we now insist that they be experts in science, also?

There is another approach that is often used. It is said that the child in learning to read must read something. Therefore, why not teach him "something" while he is learning to read. It is seldom remembered that learning to read is a very difficult task. It should not be further complicated. It is true that the child must read something. However, this something should be determined by the psychology of reading and not by any outside consideration. If science concepts can be placed within the reading textbooks without doing harm to the process of learning to read or displacing more important material, then the authors and publishers of textbooks should place it there. This, however, would not be teaching science in the sense of the question being discussed.

A further argument has its origin in the current interest in the educational systems of Europe. It is argued that the

schools of Russia and other major European nations begin the study of science much earlier than do we. There is no doubt that this is true. However, the entire structure of education in Europe differs radically from education in America. There is much greater insistence on hard work and accomplishment from the very first year. If the European system is to be used as a model in this matter of science, it must also be used as a model for a revision of our thinking concerning our schools. It would be disastrous as well as foolish to take this one item from the European system when this item is identified intimately with the entire system.

May I conclude by summing up. The primary function of the elementary school is the training of the child in the skills of learning. Personality development and content materials must take second place in the designing of the program of the school. It must be kept in mind that the elementary school is not terminal. It is a preparation for higher education. This being true it is not necessary that the elementary school be a microcosm of all society. Perhaps if the function of each level of education were perceived clearly and if there were greater articulation between all levels, we might see an end to the absurd attempts by all educational levels to fulfill all of the functions of education. Therefore, I would urge that although science concepts might be used to enrich the existing subjects of the curriculum, there should be no addition of science as a formal subject in the elementary school.